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In Ohio tomatoes continue to be the most important processed crop with a planted acreage of over 20,000 acres and about one-half million ton production; ranking second only to California. The transition to new cultural, harvest and delivery methods and new processing practices requiring greater efficiency continues to create needs for a choice of better suited varieties. To help solve these problems and assure the tomato processing industry, the OARDC has maintained a breeding and evaluation program for more than a decade. This breeding work continues to be especially directed toward improvement of the whole-pack product, upon which the smaller canning companies of the state are economically dependent. Also, of importance is the development of improved types for use in juice, sauce and paste.

For more effective utilization of present yield limits and to insure progress toward increased productivity, attributes being selected for include earlier maturity, good fruit setting ability especially during periods of heat stress so as to be able to overcome problems associated with split set; crack resistance and ability of ripe fruit to store well on the vine for extended periods and firmness to allow for effective machine harvest and bulk handling. To reduce production costs major emphasis is being given toward incorporation of jointless pedicel to facilitate machine harvest and allow delivery of fruit free of stems. Improved quality factors being selected for include acidity, pH, solids, color, and, in particular, attributes conditioning suitability for coreless whole-pack product.

In 1978 there was an increase in commercial acreage planted of the new cultivar Ohio 736 as a choice for early season whole-pack production. Advanced line O 7663 was planted in grower trials in 1978. Field results were good and in-plant processing evaluation demonstrated that this line had small core and excellent peeling characteristics. This line was named and released as Ohio 7663 in November 1978.

Ohio 7663

Ohio 7663 is a fifth generation selection from the cross [(Ohio 2070 x C28) x Florida 2125-D1-S2] x 0732. Breeding and selection was carried out in Ohio. The line has exhibited earliness and productivity comparable to C28 in experimental as well as commercial trial. Fruit size, firmness, concentration and uniformity of ripening make it suitable for mechanical harvesting and bulk handling. It was evaluated in the Northern Tomato Exchange Program (N.T.E.P.) trials in 1977 and 1978 and in other tests as well in the Mid-West and Canada, all of which indicated that it has good adaptability and commercial potential.

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Ohio 7663 represents a definite improvement over most other locally adapted varieties in that it will set fruit at higher temperatures (75°F night and 95°F. day) helping assure uniform set.

Vines of the line are medium in size, compact, determinate and adapted to high population direct seed or transplant culture. Adequate foliage cover enables good fruit quality development. Once over yield has ranged between 19.1 to 20.9 tons per acre usable fruit in replicated transplant trials from 1976 through 1978. Fruits are approximately 2 1/2 ounces in size, oval shaped, uniform ripening (ug) and have jointless pedicel (j2).

The line is resistant to Race 1 of Fusarium (I), and exhibits a high level of field tolerance to Verticillium wilt. Resistance to radial and concentric fruit cracking and good holding ability enables field storage of fruit on the vine for extended periods allowing once-over machine harvest.

Raw product, as well as processed product is characterized by suitable acid, vitamin C (ascorbic acid), solids and color which allows its utilization in a variety of tomato products. In experimental as well as commercial pilot canning trials, Ohio 7663 has been suitable for the production of whole-pack (whole-canned tomato product) with quality better than that of most varieties presently grown in Ohio; its medium fruit size, jointless pedicel-free stemming trait, small core and adaptability to lye or steam peeling allow for its efficient processing in automated whole-pack production operations without coring (coreless whole-pack).

NEW PROMISING OHIO ADVANCED BREEDING LINES

Several new lines are available which exhibit potential for improvement in productivity and quality over present varieties (Table 1 and 2). These lines will be more extensively tested and are being used in crossing to develop newer types with more desirable combinations of productivity and quality utilizing the highest levels of these characteristics available in a range of different breeding backgrounds and maturities. Progress continues in the development of varieties more adapted to machine harvest, but the need for a greater choice of suitable types remains. New lines and varieties from other sources were also included in these studies.

CULTURAL INFORMATION

Plants: Greenhouse-grown, 108 per standard flat from seed sown April 1.

Transplanted to Field: May 26, the two-row transplanter using 21-53-0 starter at 5 lb. per 100 gal. of water; 1/2 pint per plant.

Fertilizer : 1200 lb. per acre of 0-26-26 broadcast November. 70 units of nitrogen in Urea form applied before planting.

Soil: Hoytville clay Fall bedded November 20.

Herbicide: Vegiben 10% granules, 40 lb. per acre 2 weeks after transplanting.

Plot Size and Spacing: One row plants, 20 plants per row spaced 12 inches in rows 5 feet apart. Three replications.

Irrigation: None applied.

Insect and Disease Control: Air blast sprayer application according to recommendation of Tribasic copper, Bravo 6F, Thiodan 2EC, and Sevin (WP) as follows:

Date	Material and Rate/Acre
July 8	Fixed Copper @ 2 lbs.
July 22	Bravo @ 1 qt.
July 31	Fixed Copper @ 2 lbs.
	Sevin @ 2 lbs.
August 12	Bravo @ 1 qt.
	Thiodan @ 2 qt.
August 23	Bravo @ 1 qt.
	Sevin @ 2 lbs.

Weather Data

	Temperature		Rainfall (Inches)	
	1978	21 Year Avg.	1978	21 Year Avg.
May	58.1	60.1	3.57	3.27
June	69.1	69.3	2.90	3.49
July	71.2	72.2	1.49	3.98
August	70.5	70.4	1.94	2.93
September	67.9	64.5	2.00	3.11

Harvest Information

May was characterized by above average rainfall and below average temperature. The remainder of the season was characterized by a lack of rainfall which limited vine development. However, the dry conditions, which continued through harvest, did accelerate ripening and allowed for high percentages of usable fruit recovery; thus, in spite of reduced set, resultant machine harvest yield levels approached that experienced in seasons with more favorable growing conditions.

Harvesting was with an FMC Tomato Harvester and was carried out when the entries were estimated to be at a stage of fruit ripeness in which yields of marketable fruit were approaching optimum recovery (Table 1). Percentages reported of fruit recovery are on a weight basis.

Fruit quality was determined by evaluation of hand harvested samples from each plot (Table 2).

QUALITY EVALUATION

Ten field run tomatoes were selected and used for quality evaluation; the sample was cut in half, quartered, extracted in a Food Processing Equipment Co. Laboratory pulper, and de-aerated.

1. Hunter Color and Color Difference Meter; standardized with L = 25.59, aL = 27.40 and bL = 12.54 plates.

2. Agtron E-5. Instrument calibrated at 48.

3. Hunter D-6 Tomato Colorimeter (TCM).

4. Percent soluble solids. Abbe refractometer.

5. Percent total acid as citric. The raw sample used for pH determination was directly titrated using 0.1 normal sodium hydroxide solution to a pH of 8.1.

6. pH was determined by the glass electrode method.

7. Vitamin C (ascorbic acid) standard procedure:

$$\text{Dye factor} \times \text{ml. of dye} \times 100 = \frac{\text{mgs. Vitamin C}}{\text{100 gms}}$$

SEED SOURCES AND COOPERATORS

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3. Campbell Soup Co., Campbell Institute for Agricultural Research, Napoleon Ohio.
4. A. F. Castle Seed Co., Inc., Morgan Hill, California.
5. H. J. Heinz Co., 13737 Middleton Pike, Bowling Green, Ohio.
6. Hunt-Wesson Foods, Inc., Fullerton, California.
7. Libby, McNeill and Libby, Agricultural Research Department, Leipsic, Ohio.
8. E. A. Kerr, Horticultural Experiment Station, Box 387, Simcoe, Ontario.
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TABLE 1.--Field Evaluation of Processing Tomato Varieties and Test Lines for Mechanical Harvest When Yields of Marketable Fruit Were Approaching Optimum Recovery, Northwestern Branch, OARDC, Custar, Ohio 1978.

Variety or Test Line	Seed Source	Ripe Usable Tons/A	Ripe Usable % of Potential	Fruit size (oz.)	Stems %	Stem Joint	Disease Resistance
Harvest Date 8/28/78							
Castlex 1501	4	19.8	86	2.3	2	j2	
O 7678	1	19.4	90	1.9	55	+	F
O 7837	1	19.2	88	2.0	54	+	F
O 7663	1	19.1	91	2.5	2	j2	F
O 7331	1	19.0	90	1.9	47	+	F
O 7843	1	17.9	90	2.3	3	+	F
O 7668	1	17.9	92	1.7	45	+	F
O 7814	1	17.8	94	1.9	0	j2	F
O 7881	1	17.6	88	2.0	0	+	V-F
Harvest Date 9/1/78							
O 7831	1	21.8	86	2.6	0	j2	F
O 7858	1	21.4	88	2.4	1	j2	F
O 7630	1	21.0	84	3.1	31	+	V-F
O 7859	1	20.8	89	2.3	5	j2	F
O 7864	1	20.4	85	2.8	28	+	F
O 7724	1	20.3	87	2.5	1	j2	F
OHIO 736	1	20.2	85	2.8	75	+	F
O 7874	1	19.9	88	2.5	0	j2	V-F
Chico III	4	19.3	88	2.4	21	+	F
O 7721	1	18.6	85	2.6	3	j2	F
Hunts 304	6	18.5	86	2.6	21	+	
O 7891	1	16.9	89	2.3	1	j2	V-F
Harvest Date 9/6/78							
O 7681	1	27.9	90	3.0	94	+	V-F
O 7771	1	25.2	89	2.5	1	j2	F
O 7723	1	23.1	92	2.4	1	j2	F
O 7770	1	22.1	86	2.2	1	j2	F
O 7870	1	21.1	89	2.5	53	+	V-F
O 7869	1	20.2	85	2.7	81	+	F
O 7872	1	20.1	88	2.8	0	j2	V-F
O 7667	1	19.6	88	2.2	77	+	V-F
Campbell 28	3	19.3	79	3.5	98	+	F
VF 134	4	17.6	85	2.5	19	+	V-F
O 7868	1	17.0	86	2.5	48	+	F
Campbell 37	3	16.6	83	2.9	1		F
Harvest Date 9/11/78							
O 7892	1	21.0	87	2.2	0	j2	F
Heinz 2867	5	16.2	87	2.0	0	j2	
Campbell 38	3	15.3	86	2.7	5	j2	F
USDA 77B38	12	14.0	75	2.8	3	j2	V-F
LSD 5%		5.2	6	0.3	15		

TABLE 2.--Laboratory Evaluation of Processing Tomato Varieties and Test Lines, Northwestern Branch, OARDC, Custar, Ohio, 1978.

Variety or Test Line	pH	% Citric Acid	% Soluble Solids	Color			Vit. C
				Hunter CDM a/b	Agtron E5	Hunter D6 TCM	
Castlex 1501	4.65	.30	5.0	2.9	22	84.2	17.7
O 7678	4.50	.37	5.2	2.8	24	--	21.5
O 7837	4.68	.32	5.4	3.0	21	83.5	21.5
O 7663	4.48	.37	5.6	2.9	24	82.7	17.1
O 7731	4.54	.34	5.0	2.9	23	87.5	19.6
O 7843	4.62	.32	4.8	3.0	24	84.4	15.2
O 7668	4.52	.34	5.0	2.7	24	82.5	23.4
O 7814	4.52	.42	5.4	2.9	21	85.3	20.5
O 7881	4.48	.41	5.2	2.8	23	82.0	19.2
O 7831	4.55	.33	5.2	2.9	24	82.1	13.9
O 7858	4.46	.39	5.9	2.9	35	71.0	12.0
O 7630	4.48	.41	5.6	2.9	27	83.8	17.7
O 7859	4.52	.37	4.8	3.0	23	85.5	19.0
O 7864	4.55	.36	5.2	2.9	21	86.0	16.1
O 7724	4.40	.36	5.4	2.8	37	--	19.8
OHIO 736	4.55	.44	5.6	2.8	22	82.7	25.4
O 7874	4.52	.36	5.2	2.7	25	--	26.5
Chico III	4.60	.31	5.6	3.0	25	82.1	15.8
O 7721	4.52	.31	5.0	2.9	25	83.5	19.0
Hunts 304	4.94	.22	5.4	2.7	24	85.2	21.1
O 7891	4.50	.38	5.8	3.2	34	80.4	15.2
O 7681	4.62	.33	5.2	2.9	23	86.4	19.2
O 7771	4.70	.31	5.0	2.9	21	84.5	16.3
O 7723	5.54	.35	5.2	2.9	22	81.6	17.7
O 7770	4.68	.32	5.8	2.8	23	83.4	18.0
O 7869	5.55	.36	5.8	3.3	18	90.2	19.0
O 7872	4.62	.37	5.2	2.9	23	84.9	24.2
O 7667	4.54	.42	6.0	2.9	27	80.2	18.6
Campbell 28	4.48	.38	5.5	3.0	26	80.5	20.2
VF 134	4.62	.32	5.4	3.0	19	87.9	18.6
O 7868	4.56	.43	5.6	2.9	22	84.6	19.2
Campbell 37	4.48	.36	5.0	2.7	26	81.3	20.9
O 7892	4.42	.45	5.8	3.3	23	84.9	15.8
Heinz 2867	4.46	.41	5.2	3.0	24	82.3	16.4
Campbell 38	4.42	.39	6.2	3.0	26	81.1	17.7
USDA 77B38	4.52	.27	5.0	3.1	26	82.0	18.6

TABLE 3.--Evaluation of 1978 N.T.E.P. (Northern Tomato Exchange Program) Entries, OARDC, Wooster, Ohio

NTEP Entry No.	Cultivar	Source	Earliness	Cover	Set Concentration	Fruit Size	Cracking	Firmness	Separation	Stylar Scar	Internal Color	Coreless Whole-Pack	MH or HH
7833	C 37	3	3	5	3	3	4	4	3	2	4	3	MH-HH
7834	Chico III	4	4	3	4	3	5	2	4	4	2	5	MH
7801	ONT 7714	8	5	2	4	2	4	3	3	5	4	2	MH
7802	Md 142	2	3	3	4	3	4	4	3	4	4	3	MH
7803	O 7630	1	4	3	3	4	3	2	2	3	3	1	HH-MH
7804	NY 77-472	10	3	2	5	1	5	3	5	5	2	4	MH-HH
7805	77B16	12	2	5	3	2	4	4	2	4	3	2	MH-HH
7806	P2168	9	1	2	4	4	44	4	3	2	3	3	HH-MH
7807	PU 76-169	11	3	4	3	2	3	5	4	4	4	5	MH
7808	NY 475	10	5	1	5	1	4	3	5	4	2	5	MH
7809	Ont. 738	8	1	4	2	5	2	4	1	1	5	1	HH
7810	O 7734	1	4	3	2	4	3	2	2	2	3	3	MH-HH
7811	Md 146	2	3	2	5	3	4	3	4	4	4	4	MH-HH
7812	P 2161	9	3	2	4	3	4	2	3	4	2	2	MH-HH
7813	PU 78A12	11	3	1	5	2	5	4	3	5	5	3	HH-MH
7814	Ont 7511	8	2	3	2	4	1	2	1	3	5	1	HH
7815	NY 76-457	10	1	4	2	3	3	2	2	3	3	2	HH
7816	O 7663	1	3	2	4	3	3	4	3	4	3	2	MH-HH
7817	Md 145	2	3	2	4	1	5	3	4	5	4	4	MH
7818	77B28	12	2	4	1	3	4	4	3	4	4	3	MH-HH
7819	P 1773	9	4	4	3	4	4	4	3	3	5	5	MH-HH
7820	PU 78A03	11	4	2	4	3	2	3	3	3	5	4	HH-MH
7821	Ont 752	8	4	1	5	2	4	3	4	5	3	4	MH
7822	O 7667	1	2	2	5	2	4	2	3	3	3	3	HH-MH
7823	Md 147	2	1	4	4	1	5	4	4	5	3	5	MH-HH
7824	P 1798	9	4	2	3	3	1	4	2	2	5	1	MH
7825	77B38	12	1	5	3	3	5	4	3	4	2	3	MH-HH
7826	Ont 778	8	2	2	3	4	2	4	1	2	3	1	HH
7827	PU 78A02	11	3	3	4	2	3	4	4	4	4	3	MH-HH
7828	O 7721	1	1	3	3	2	4	3	3	4	2	3	MH-HH
7829	L8990B	7	5	1	4	3	1	4	3	4	2	3	MH
7830	P2044	9	2	4	2	4	2	4	3	2	3	2	HH
7831	PU 76-02	11	1	3	4	1	4	4	4	5	5	4	MH
7832	Md 148	2	1	5	4	4	4	3	4	5	2	5	MH

TABLE 4. Evaluation of 1978 N.T.E.P. Entries. Average of 10 Locations (Beltsville and Salisbury, Md., Simcoe, Trenton and Ridgetown, Ontario, West Lafayette, IN., Wooster, Leipsic and Bowling Green, OH., and Columbia, MO.).

NTEP Entry No.	Cultivar	Source	Earliness	Yield	Fruit Size	Cracking	Firmness	Separation	Scar Core	Stylar Scar	Cover	Set Concentration	BER	Internal Color	Hand Harvest	Mechanical Harvest	Coreless Whole-Pack
7801	Ont 7714	8	3.9	3.0	1.6	4.4	3.5	3.9	4.3	4.9	2.6	3.5	4.6	4.1	1.3	4.0	4.3
7802	Md 142	2	3.2	3.0	2.6	4.4	3.8	3.7	3.8	4.7	2.9	3.2	4.6	4.1	2.5	3.2	3.1
7803	O 7630	1	3.2	3.1	3.1	4.0	3.4	3.4	2.8	4.2	3.6	3.5	4.4	3.1	3.1	3.1	2.2
7804	NY 77-472	10	3.8	3.3	2.0	3.8	3.5	4.1	4.2	4.7	2.7	4.0	4.8	3.3	2.0	3.7	3.6
7805	77B16	12	2.0	2.5	3.1	3.9	3.8	3.7	3.3	4.2	4.1	2.7	4.8	3.2	2.5	2.9	3.0
7806	P 2168	9	2.5	3.5	3.6	4.1	3.3	3.6	3.0	3.8	3.6	3.0	4.0	3.1	2.9	2.6	2.4
7807	PU 76-169	11	3.1	3.5	2.4	3.8	4.1	4.0	3.9	4.6	3.6	3.4	3.7	3.8	2.5	3.9	3.7
7808	NY 475	10	4.5	3.1	1.6	3.9	3.6	4.2	4.1	4.6	2.5	4.1	4.6	3.2	1.8	3.6	3.6
7809	Ont 738	8	2.6	2.8	4.1	3.8	2.9	3.0	2.3	3.4	3.6	2.7	4.5	4.1	3.3	2.5	1.7
7810	O 7734	1	3.1	3.1	3.7	4.1	3.2	2.9	2.6	3.3	3.2	3.0	4.4	3.3	3.0	2.9	1.9
7811	Md 146	2	2.8	3.5	3.1	4.4	3.5	3.7	3.6	4.4	2.8	3.5	4.1	3.4	2.3	3.6	2.7
7812	P 2161	9	2.7	2.9	3.0	3.9	2.8	3.3	3.0	4.3	3.2	2.8	4.6	2.9	2.3	2.9	2.9
7813	PU 78A12	11	3.6	3.3	3.0	4.2	3.9	3.6	3.6	4.7	3.1	3.9	4.6	4.1	3.0	3.9	3.8
7814	Ont 7511	8	2.8	2.8	3.4	3.4	2.9	2.9	2.1	3.3	3.2	3.0	4.3	4.1	3.4	2.3	1.5
7815	NY 76-457	10	2.6	3.0	3.2	3.6	2.6	3.0	2.7	4.0	3.5	2.8	4.4	3.1	3.1	2.2	2.1
7816	O 7663	1	3.3	3.0	2.9	4.1	3.7	3.6	3.8	4.6	3.2	3.7	4.1	3.3	2.6	3.6	3.6
7817	Md 145	2	3.1	3.2	1.9	4.4	4.0	4.1	3.9	4.1	3.0	3.3	4.5	3.6	1.9	3.3	3.5
7818	77B28	12	2.3	3.3	3.4	4.3	3.8	3.8	3.0	4.4	3.6	2.8	4.5	3.7	3.1	3.4	3.1
7819	P 1773	9	2.8	3.3	3.9	3.7	3.7	3.4	2.9	3.3	3.6	2.9	4.5	4.0	3.4	2.3	2.6
7820	PU 78A03	11	3.1	3.5	3.1	3.7	3.8	3.5	3.8	4.3	2.8	3.7	4.8	4.3	3.6	3.1	3.6
7821	Ont 752	8	3.4	3.1	2.0	3.7	3.2	3.7	4.3	4.8	2.2	3.8	4.8	3.7	2.2	3.6	3.5
7822	O 7667	1	3.2	3.2	2.6	3.9	3.1	3.5	3.6	4.3	3.2	3.7	4.8	3.5	2.8	2.9	3.2
7823	Md 147	2	2.3	3.4	2.1	4.5	3.6	3.8	4.2	4.7	3.8	3.3	4.3	2.8	2.0	3.7	3.6
7824	P 1798	9	3.3	2.5	3.1	3.2	3.9	3.3	2.9	3.5	2.7	4.6	3.7	4.2	2.4	2.8	2.4
7825	77B38	12	1.6	2.6	3.5	4.4	3.8	3.4	2.7	4.2	4.4	2.6	4.1	2.9	2.8	2.8	2.4
7826	Ont 778	8	2.6	3.0	3.8	3.6	3.4	2.6	2.4	3.4	2.8	2.8	4.5	3.9	3.8	1.9	2.4
7827	PU 78A02	11	3.2	3.3	1.9	3.9	3.6	3.9	4.4	4.7	3.3	3.8	4.8	4.2	2.4	3.6	4.1
7828	O 7721	1	2.8	3.2	3.2	4.3	3.7	3.8	3.4	4.4	3.1	3.3	4.3	3.2	3.0	3.0	3.3
7829	L 8990B	7	3.8	3.1	3.1	2.6	3.8	3.8	3.0	4.5	2.3	3.4	4.8	2.8	2.2	3.3	2.3
7830	P 2044	9	1.9	3.3	3.9	3.6	3.4	3.5	2.8	3.4	3.7	2.6	4.5	4.0	3.6	2.0	2.1
7831	PU 76-02	11	3.9	2.5	2.0	4.0	4.0	3.9	3.8	4.6	3.3	3.3	4.1	4.2	1.5	3.4	3.6
7832	Md 148	2	1.9	3.2	3.2	4.1	3.1	3.6	3.7	4.4	4.1	2.6	4.4	2.6	1.7	2.7	2.7
7833	C 37	3	2.8	3.0	3.0	4.4	4.3	3.5	3.3	3.2	3.8	2.8	3.6	3.7	3.4	3.3	3.1

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